

Conservation

Key Terms

conservation • sustainability • endangered species • habitat restoration

Getting the Idea

Humans are part of the ecosystems in which they live. Like other organisms, humans rely on those ecosystems for their needs. The human population, because of its rapid growth and increasing technological sophistication, has had a major effect on the environment. Humans live in nearly all areas of the planet, and in many cases humans have outcompeted numerous other organisms and used up resources. Unlike other species, however, humans can choose behaviors that reduce their impact on the environment.

Consumption and Sustainable Development

People around the world are becoming more aware of how their activities affect resource availability and other conditions in the environment. To deal with these challenges, many people are learning how to manage or change their use of natural resources. **Conservation** is the careful use and protection of resources. It includes managing natural resources to prevent overuse, destruction, or neglect.

Natural resources are classified as either renewable or nonrenewable. *Renewable resources* are those that can be renewed or replaced through natural processes at nearly the same rate at which they are used. These resources include forests, which can be replanted after cutting, and freshwater, which can be purified and recycled. Air, soil, and useful organisms such as fish are also considered renewable resources. Although these resources are renewable, their availability can be limited by factors other than rate of use. For example, crop growth is limited by the amount of land and water available. Climate and the quality of soil can also limit crop growth.

Nonrenewable resources cannot be replaced by natural processes as quickly as they are used. Fossil fuels are nonrenewable natural resources. Because these fuels take millions of years to form, they cannot be replaced by nature as quickly as they are used. Minerals, including metals, are also nonrenewable resources. Earth's supply of minerals is limited, and these resources can be depleted rapidly as their use in more and more technologies increases.

Responsibility for taking care of something belonging to others is known as *stewardship*. Stewardship of the environment refers to the planning and responsible management of resources. One aspect of stewardship is fostering activities that allow sustainability. **Sustainability** is the ability of a population or ecosystem to survive indefinitely. For the human population to be sustainable, people must develop ways to meet their needs without depleting supplies of natural resources or damaging the environment. This process is called *sustainable development*. A key aspect of sustainable development is finding ways to recycle and reuse resources and to reduce the amount that people use.

Careful community planning can be part of sustainable development. This may include building homes closer together as well as nearer schools and businesses. If people do not have to travel as far, they use less energy. Sustainable practices can also be used in the construction of buildings. Sustainable buildings may have more efficient appliances and better insulation to save energy. They may have solar panels on their roofs to generate electricity. A sustainable home or school may cost more to build initially, but it uses less energy. Over time, a homeowner or school district can save money while conserving energy.

Sustainability also requires changes in the way land is used. Land provides living space to humans and other organisms. Most raw materials used in manufacturing come from the land. Land with fertile soil is used to grow crops. However, misuse of farmland can exhaust the nutrients crops need. Soil conservation is essential for maintaining or improving agricultural capacity. For example, land can be nourished with organic matter (including manure and clippings from dead plants) to maintain or restore its fertility. When a field is not being used to grow useful crops, farmers can plant cover crops to hold the soil in place and reduce erosion. Some cover crops, such as clover, also add nutrients to the soil. Because soil can be used repeatedly and restored if damaged, it is considered a renewable resource. However, preserving soil is easier and less expensive than restoring lost or damaged soil.

Human Activities That Help the Environment

As people become more aware of the ways human actions can harm the environment, they are looking for ways to prevent additional damage and repair past damage. The ban on DDT and the breeding programs for bald eagles and peregrine falcons you read about in the last lesson are examples of ways to protect habitats and species.

People are working to reduce the use of fossil fuels, both to conserve these resources and to reduce pollution. People are also trying to use other resources more wisely and to dispose of wastes more carefully. Some individuals and groups are working to conserve wildlife by limiting hunting and fishing.

The table lists a few of the many ways people can help protect the environment.

Ways to Protect the Environment

Action	Effect
Drive fuel-efficient cars, drive less, use public transportation	Releases fewer chemicals that contribute to acid rain, lung problems, and global warming; conserves energy; reduces risk of oil spills
Buy energy-efficient appliances, lower thermostats in winter and raise them in summer	Saves fossil fuels and reduces air pollution
Plant only native species in gardens	Reduces risk of outcompeting native species
Use less paper	Conserves forests, saves energy, reduces water pollution
Use less water for washing and for watering lawns	Conserves limited freshwater supply
Grow and buy organic food	Reduces demand for pesticides and fertilizer, protects soil and groundwater
Eat only sustainably harvested fish	Reduces overfishing, protects marine ecosystems and species

In order to restore a habitat, ecologists must conduct a great deal of research to learn about such things as the habitat's carrying capacity. Recall that carrying capacity is the largest population that an environment has the resources to support. Knowing an environment's carrying capacity is important to conservationists trying to protect and manage wildlife populations because maintaining a healthy population requires enough organisms for genetic variety. In addition, some individuals or species need large areas of land or volumes of water in which to live and breed. Other organisms can flourish in small areas. Biologists can use information about carrying capacity to decide how much habitat must be conserved to protect a given species.

To restore a habitat, ecologists must know how the species in an ecosystem interact and depend upon one another. For example, the eastern oyster is a keystone species in coastal habitats in North Carolina. Recall that populations of this species have declined, partly because of overharvesting. As a keystone species, the eastern oyster provides needed food and habitat to other species in the ecosystem. It also helps control pollution by removing pollutants from water as it feeds. Scientists observed that the decline of the oyster population caused a decline in other aquatic populations and that the water in those habitats gradually became more polluted. Scientists working to restore the eastern oyster habitat are using oyster shells taken from other areas to build new oyster reefs. Scientists are also trying to increase the oyster population by releasing oyster larvae hatched in aquatic farms back into the estuaries. It is hoped that these practices, along with restrictions on oyster harvests, will encourage oyster growth and help restore the estuary ecosystem.

One important question in trying to preserve species and their habitats is how widely distributed the organisms are. Some species may be found in only one habitat in a single ecosystem. Others may live in only a few habitats that are located close enough to one another that they could all be damaged or destroyed by a single disaster, such as a hurricane or wildfire. In order to protect species, scientists need to study the organisms closely to learn as much as possible about their resource needs and about the ecosystems in which they live.

Discussion Question

What are some conservation methods that you currently practice in your everyday life? Based on what you have read in this lesson, what are some other things you could do in your daily life to help reduce pollution and conserve natural resources?

Lesson 13.2: Critical Reading

Name _____

Read these passages from the text and answer the questions that follow.

Characteristics of Viruses

An individual virus is called a virion. It is a tiny particle much smaller than a prokaryotic cell. Because viruses do not consist of cells, they also lack cell membranes, cytoplasm, ribosomes, and other cell organelles. Without these structures, they are unable to make proteins or even reproduce on their own. Instead, they must depend on a host cell to synthesize their proteins and to make copies of themselves. Viruses infect and live inside the cells of living organisms. When viruses infect the cells of their host, they may cause disease. For example, viruses cause AIDS, influenza (flu), chicken pox, and the common cold.

Although viruses are not classified as living things, they share two important traits with living things. They have genetic material, and they can evolve. This is why the classification of viruses has been controversial. It calls into question just what it means to be alive. What do you think? How would you classify viruses?

Structure and Classification of Viruses

Viruses vary in their structure. The structure of a virus determines how it is classified.

Structure of Viruses

A virus particle consists of DNA or RNA within a protective protein coat called a capsid. The shape of the capsid may vary from one type of virus to another.

Some viruses have an envelope of phospholipids and proteins. The envelope is made from portions of the host's cell membrane. It surrounds the capsid and helps protect the virus from the host's immune system. The envelope may also have receptor molecules that can bind with host cells. They make it easier for the virus to infect the cells.

Classification of Viruses

Viruses are classified on the basis of several traits. For example, they may be classified by capsid shape, presence or absence of an envelope, and type of nucleic acid. Table 13.2 gives examples of virus families and their traits. Most systems of classifying viruses identify at least 20 virus families, but only 4 are shown in the table. Have any of these viruses made you sick?

TABLE 13.2: Virus Classification: Four Examples

Virus Family	Capsid Shape	Envelope Present?	Type of Nucleic Acid	Disease Caused by a Virus in this Family
Adenovirus	icosahedral	no	DNA	acute respiratory disease
Herpesviruses	icosahedral	yes	DNA	chicken pox
Orthomyxoviruses	helical	yes	RNA	influenza
Coronaviruses	complex	yes	RNA	common cold

1. Describe a virion.
2. Why are viruses not able to make their own proteins?
3. Describe the structure of a virus.
4. What are the traits used to classify a virus?
5. Do you think viruses should be classified as "living organisms"? Why or why not?
6. How could viral infections, such as HIV and influenza, affect human populations?